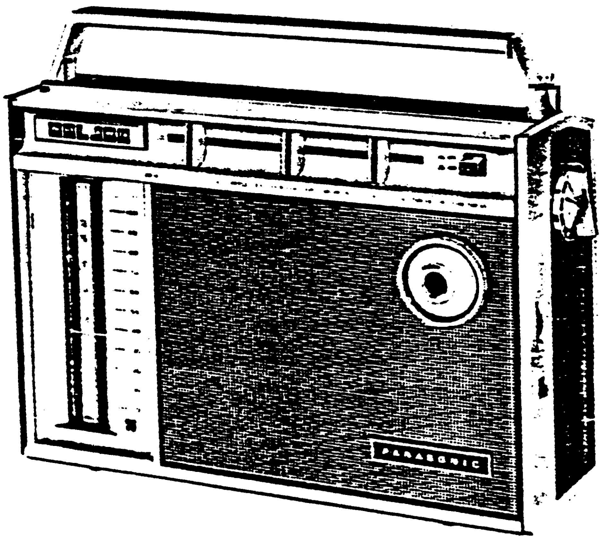
ISO

ORDER NO. RD-643

NATIONAL PANASONIC Service Manual

MULTI-BAND PORTABLE RADIO

MODEL RF-1600B



SPECIFICATIONS

Frequency Range:

VHF	136~174 MHz
AIR	108~136 MHz
FM	87~108 MHz
AM	525~1605 kHz (571~187m)
MB	1.6~4.5 MHz (187~66.7m)
SW	5.9~18 MHz (50.8~16.7m)

Intermediate Frequency:

VHF, AIR & FM 10.7 MHz
AM, MB & SW 455 kHz

Transistors:

2SC429	VHF RF Amplifier
2SC429	VHF Converter
2SC429	AIR RF Amplifier
2SC645	AIR Converter
2SC429	FM RF Amplifier
2SC645	FM Converter
2SC645	FM 1st IF Amplifier & AM Converter
2SC469	FM 2nd IF Amp. & AM 1st IF Amp.
2SC469	FM 3rd IF Amp. & AM 2nd IF Amp.
2SC183	Squelch Amplifier
2SB173	1st AF Amplifier
2SB173	2nd AF Amplifier
2SB175	3rd AF Amplifier
2SB175	Ripple Filter
2SB324 2SB324	Power Amplifier (push-pull)

Diodes:

1S351	FM AFC
1N34A	FM VHF RF D.AGC
1N34A	IF D.AGC
1S1211 1S1211	Operation Compensator
1S1211	Switching
1N34A 1N34A	FM Detector
1N34A	AM Detector & AGC
0A90	AIR D.AGC

Sensitivity:

VHF	1μV for 50mW Output
AIR	1μV for 50mW Output
FM	1μV for 50mW Output
AM	20μV/m for 50mW Output
MB	20μV/m for 50mW Output
SW	20μV/m for 50mW Output

Power Output:
1.8W Maximum

Power Source:
AC 220V 50-60 Hz or
6V (four "D" size flashlight batteries)
(NATIONAL UM-1 or equivalent)

Power Consumption:
5 W at 117V (AC Only)

Speaker:
12cm (5") PM Dynamic Speaker, 8Ω.

Cabinet Dimensions:
292(Wide) × 204(High) × 95(Deep) mm
(11½" × 8½" × 3¾")

Weight:
3 kg. (6 lb. 10 oz.) without batteries

<EXPORT DIVISION>
MATSUSHITA ELECTRIC TRADING CO., LTD.
P. O. Box 288, Central Osaka, Japan

MATSUSHITA ELECTRIC INDUSTRIAL CO., LTD.
RADIO and STEREO DIVISION

To Remove Chassis (Refer to figs. 1-A & B)

1. Remove six (6) control knobs from cabinet.
2. Remove five (5) cabinet back cover mounting screws, nos. 1~5, as illustrated in fig. 1-A.
3. Unsolder leadwires to battery case.
4. Remove seven (7) red chassis-mounting screws, nos. 1~7, as illustrated in fig. 1-B.
5. To remove chassis completely, unsolder leadwires to speaker and lead holder terminals.
6. To reassemble, reverse the above procedure.

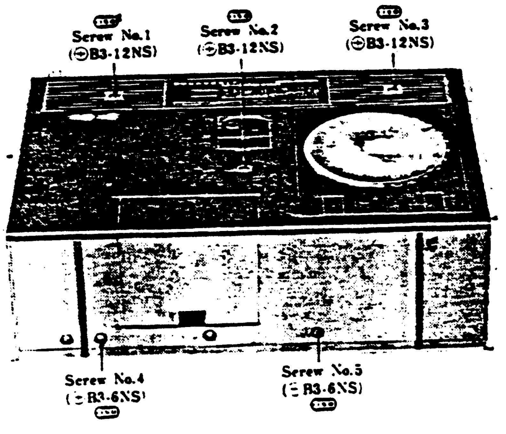

Screw No.1
(⊕B3-12NS)
Screw No.2
(⊕B3-12NS)
Screw No.3
(⊕B3-12NS)
Screw No.4
(⊕B3-6NS)
Screw No.5
(⊕B3-6NS)

Fig. 1-A

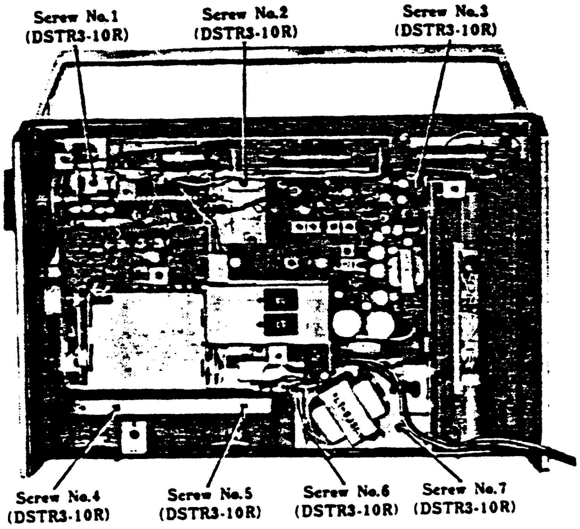

Screw No.1
(DSTR3-10R)
Screw No.2
(DSTR3-10R)
Screw No.3
(DSTR3-10R)
Screw No.4
(DSTR3-10R)
Screw No.5
(DSTR3-10R)
Screw No.6
(DSTR3-10R)
Screw No.7
(DSTR3-10R)

Fig. 1-B

Fig. 1 Top View–Disassembly Points

To Remove Dial Scale (Refer to fig. 2)

1. Remove chassis from cabinet. (Refer to chassis removal instructions)
2. Cut band selector wire.
3. Unsolder leadwires from dial scale.
4. Remove two (2) scale bracket mounting screws as illustrated in fig. 2.
5. To reassemble, reverse the above procedure.

   Notes: A. Put a ball bearing onto hole of bracket (RUL-402) before mounting dial scale.
   B. When stringing band selector wire, refer to band selector wire stringing guides.

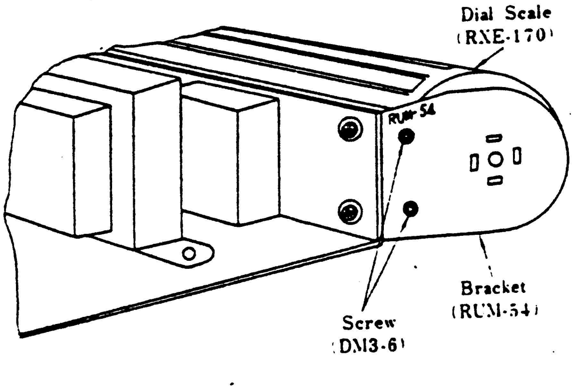
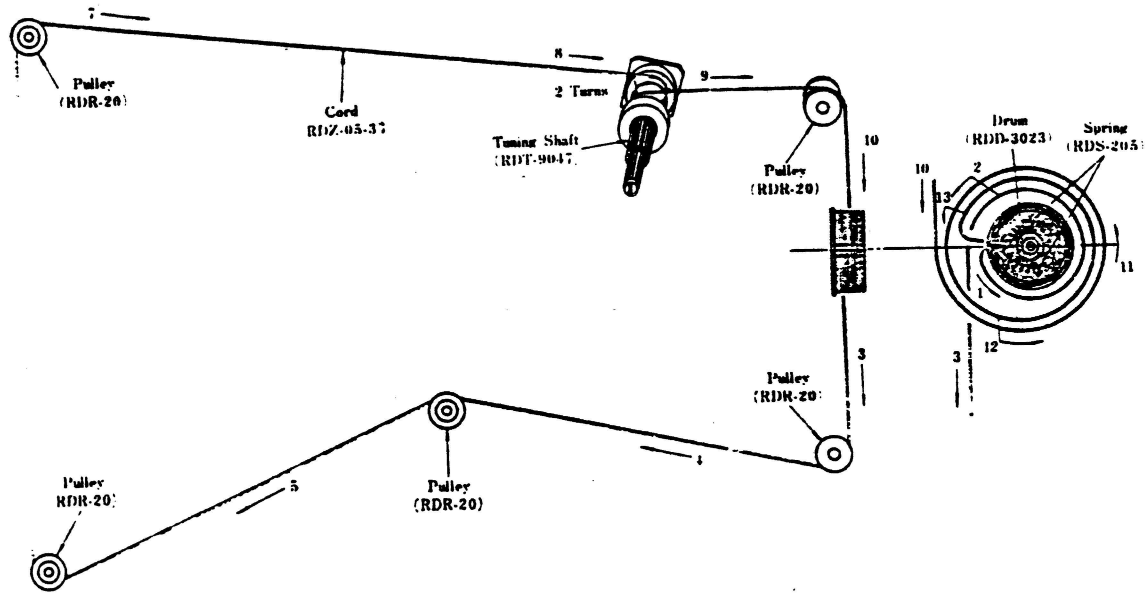

Dial Scale
(RXE-170)
RUM-54
Bracket
(RUM-54)
Screw
(DM3-6)

Fig. 2 Dial Scale Disassembly


7
Pulley
(RDR-20)
Cord
RDZ-05-37
8
2 Turns
Tuning Shaft
(RDT-9047)
9
Pulley
(RDR-20)
10
Drum
(RDD-3023)
Spring
(RDS-205)
10
2
13
11
1
12
3
3
Pulley
(RDR-20)
4
Pulley
RDR-20)
5
Pulley
(RDR-20)

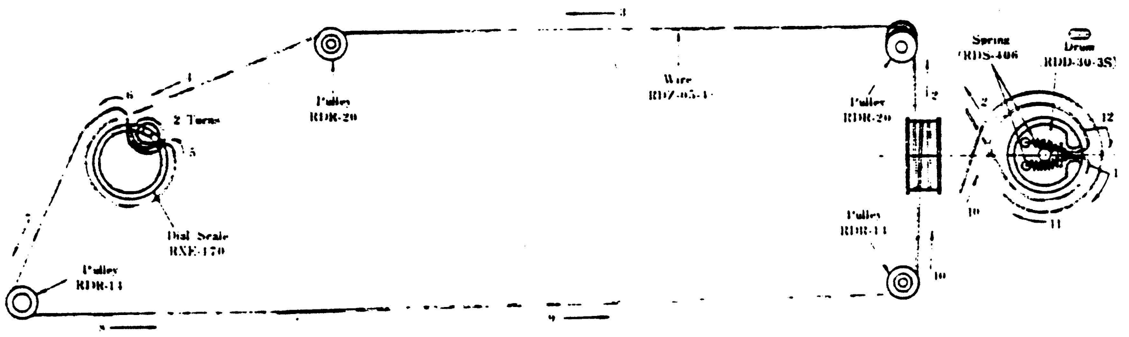
Notes:

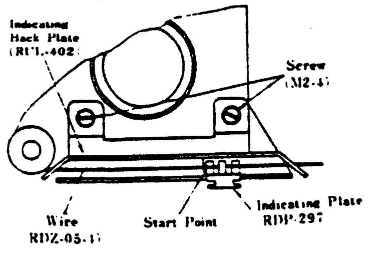
1. Dial cord length is 120 cm (47¼").
2. Tuning gang is positioned at minimum capacity.
3. Arrow marks (1~13) indicate correct order and direction of stringing dial cord.
4. Cement dial cord ends.

To Mount Dial Pointer

1. Set tuning gang to fully closed position.
2. Set band selector switch to "FM" position.
3. Set dial pointer to Start point of dial scale.
4. Attach dial cord to dial pointer.

Fig. 3 Dial Cord Stringing Guide


3
Wire
RDZ-05-4
Pulley
RDR-20
4
6
2 Turns
5
Dial Scale
RXE-170
7
Pulley
RDR-14
8
9
Pulley
RDR-20
12
Spring
(RDS-406
Drum
RDD-30-3S)
2
12
1
10
11
Pulley
RDR-14
10


Indicating
Back Plate
(RUL-402)
Screw
(M2-4)
Wire
RDZ-05-4)
Start Point
Indicating Plate
RDP-297

Notes:

1. Set Band selector switch to AM position.
2. Set dial scale to AM position.
3. Band selector wire length is 120 cm (47¼").
4. Arrow marks (1~12) indicate correct order and direction of stringing band selector wire.
5. Resolder wire ends.

To Mount Indicating Plate

1. Set band selector switch to AM position.
2. Remove two indicating back plate mounting screws.
3. Set left side of indicating plate to start mark of chassis.
4. Attach wire to indicating plate.

Fig. 4 Band Selector Wire Stringing Guide

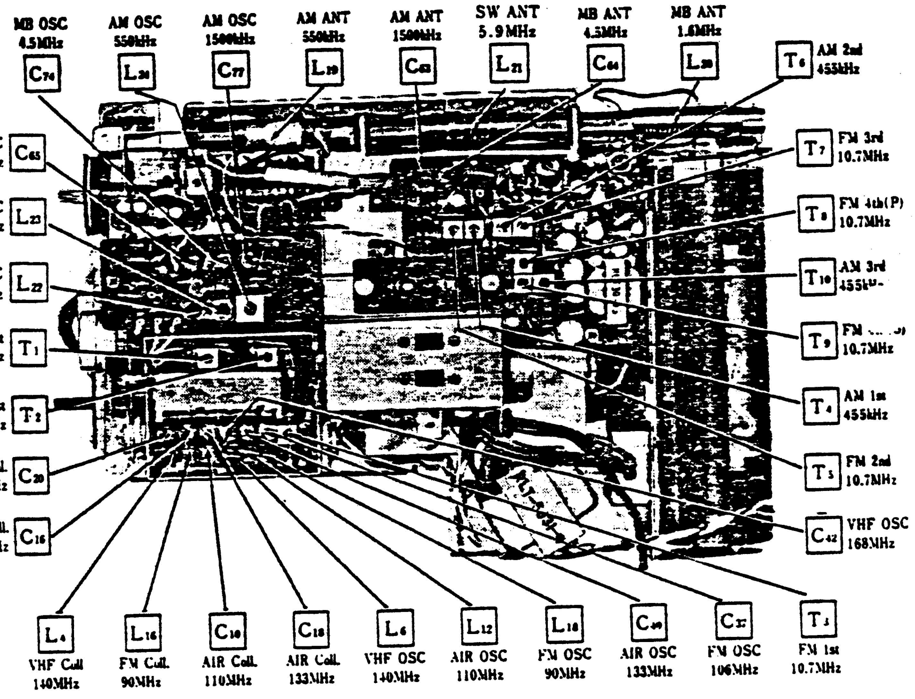

MB OSC 4.5MHz C74
AM OSC 550kHz L24
AM OSC 1500kHz C77
AM ANT 550kHz L19
AM ANT 1500kHz C63
SW ANT 5.9MHz L21
MB ANT 4.5MHz C64
MB ANT 1.6MHz L20
T6 AM 2nd 455kHz
SW OSC 18MHz C65
MB OSC 1.6MHz L23
SW OSC 5.9MHz L22
VHF 1st 10.7MHz T1
AIR 1st 10.7MHz T2
VHF Coll. 168MHz C20
FM Coll. 106MHz C16
T7 FM 3rd 10.7MHz
T8 FM 4th(P) 10.7MHz
T10 AM 3rd 455k
T9 FM 10.7MHz
T4 AM 1st 455kHz
T5 FM 2nd 10.7MHz
C42 VHF OSC 168MHz
L4 VHF Coll 140MHz
L16 FM Coll. 90MHz
C10 AIR Coll. 110MHz
C18 AIR Coll. 133MHz
L6 VHF OSC 140MHz
L12 AIR OSC 110MHz
L18 FM OSC 90MHz
C40 AIR OSC 133MHz
C37 FM OSC 106MHz
T3 FM 1st 10.7MHz

Fig. 5 Top View—Alignment Points

ALIGNMENT INSTRUCTIONS

EQUENCY & DISTANCE ON DIAL SCALE

To accurately align the proper frequencies to the dial scale, refer to Table and mark the edge of the dial scale plate accordingly, using the "Start point" mark on the dial scale as a reference point.

TABLE

Band	Frequency	Distance From "Start Point"		Band	Frequency	Distance From "Start Point"	
AM	550 kHz	11.72 mm	15/32"	FM	90 MHz	27.6 mm	1 3/32"
	1500 kHz	98.2 mm	3 7/8"		106 MHz	90.5 mm	3 9/16"
MB	1.6 MHz	5.15 mm	7/32"	AIR	110 MHz	21.0 mm	27/32"
	4.5 MHz	102.74 mm	4 1/32"		133 MHz	91.4 mm	3 19/32"
SW	5.9 MHz	4.1 mm	5/32"	VHF	140 MHz	21.8 mm	27/32"
	18 MHz	103.67 mm	4 3/32"		168 MHz	86.6 mm	3 13/32"

I, MB & SW IF ALIGNMENT

utput of signal generator should be no higher than necessary to obtain an output reading.

Set volume control to maximum.
Set treble control to maximum.
Set bass control to maximum.
Set squelch control to OFF.
Set AFC switch to OFF.
Set fine tuning to center.
Set AC-DC selector switch to DC.
Set power source switch to ON.
Set phono-radio selector switch to radio.
Set power source voltage to 6 volts DC.

SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	INDICATOR	ADJUSTMENT	REMARKS
Fashion loop of several turns of wire and radiate signal into loop of receiver.	455 kHz (400∾ Mod.)	Point of non-interference (on/about 600 kHz)	Output meter across voice coil.	T_4 (1st IFT) T_6 (2nd IFT) T_{10} (3rd IFT)	Adjust for maximum output.

FM, AIR & VHF IF ALIGNMENT

OSCILLOSCOPE

Set sweep selector of oscilloscope to "External Sweep".
Apply 60~ sweep signal from sweep generator to horizontal input terminals of oscilloscope.

EQUIPMENT REQUIRED

Signal generator that provides 10.7 MHz marker.
Sweep generator that provides 10.7 MHz center frequency and 400 kHz sweep width.

Set volume control to minimum.
Set treble control to maximum.
Set bass control to maximum.
Set squelch control to OFF.
Set AFC switch to OFF.

Set fine tuning to center.
Set AC-DC selector switch to DC.
Set power source switch to ON.
Set phono-radio selector switch to radio.
Set power source voltage to 6 volts DC.

Note: When alignment Step 2~4, unsolder lead between test point TP_6 and point Ⓐ before alignment and resolder it after alignment.

Band Switch Position	SWEEP GENERATOR COUPLING	SIGNAL GENERATOR COUPLING	RADIO DIAL SETTING	INDICATOR	ADJUSTMENT	REMARKS
FM	High side thru .001 μF to point TP_8. Common to chassis.	High side thru .001 μF to point TP_8. Common to chassis.	Point of non-interference	Connect vert. Amp. of scope to point TP_6. Common to chassis.	T_3 (FM 1st IFT) T_5 (2nd IFT) T_7 (3rd IFT) T_8 (4th IFT(P)	Adjust for maximum amplitude and proper linearity between ±100 kHz markers. (Refer to fig. 8)
VHF	High side thru .001 μF to point TP_{10}. Common to chassis.	High side thru .001 μF to point TP_{10}. Common to chassis.	〃	〃	T_1 (VHF 1st IFT)	〃
AIR	High side thru .001 μF to point TP_9. Common to chassis.	High side thru .001 μF to point TP_9. Common to chassis.	〃	〃	T_2 (AIR 1st IFT)	〃
FM	High side thru .001 μF to point TP_8. Common to chassis.	High side thru .001 μF to point TP_8. Common to chassis.	〃	Connect vert. Amp. of scope to point TP_7. Common to chassis.	T_9 (4th IFT)(S)	Adjust T_9 so that 10.7 MHz marker appears at the center. (Refer to fig. 9)

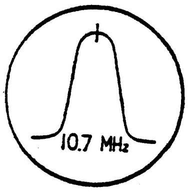


Fig. 8

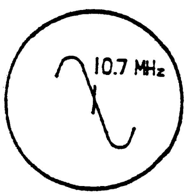


Fig. 9

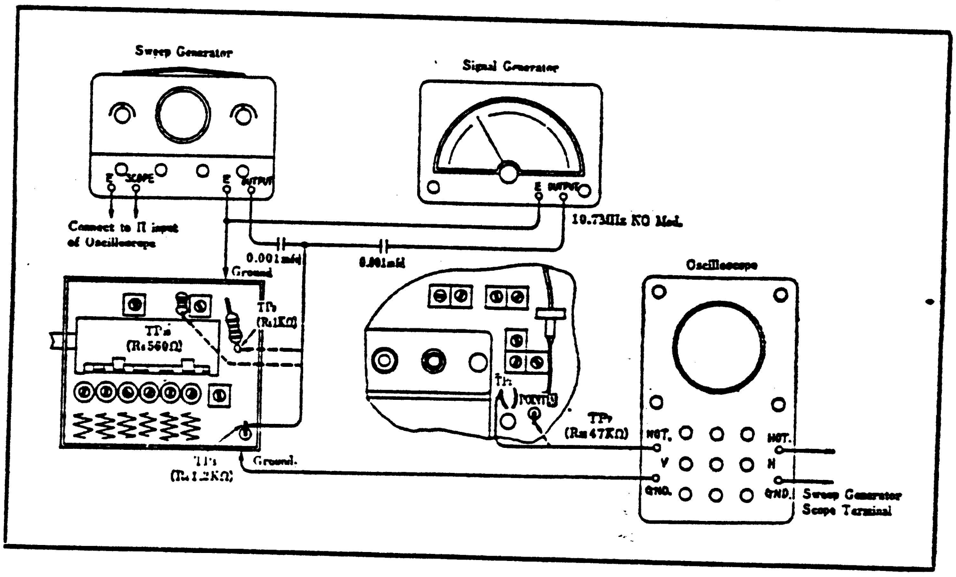

Sweep Generator
E
SCOPE
E
OUTPUT
Connect to H input of Oscilloscope
Signal Generator
E
OUTPUT
10.7MHz KO Mod.
0.001mfd
0.001mfd
Ground
TP₁₀ (R:560Ω)
TP₉ (R:1KΩ)
TP₈ (R:1.2KΩ)
Ground.
TP₆
POINT A
TP₇ (R=47KΩ)
Oscilloscope
HOT.
V
GND.
HOT.
H
GND.
Sweep Generator Scope Terminal

Fig. 10 Recommended Equipment Connection for FM, AIR & VHF IF Alignment

AM, MB & SW RF ALIGNMENT

Output of signal generator should be no higher than necessary to obtain an output reading.

Set volume control to maximum.
Set treble control to maximum.
Set bass control to maximum.
Set squelch control to OFF.
Set AFC switch to OFF.

Set fine tuning to center.
Set AC-DC selector switch to DC.
Set power source switch to ON.
Set phono-radio selector switch to radio.
Set power source voltage to 6 volts DC.

Note: Connect 12 PF between test point **TP_4** and chassis before alignment and remove it after alignment.

	Band Switch Position	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	INDICATOR	ADJUSTMENT	REMARKS
6	AM	Fashion loop of several turns of wire and radiate signal into loop of receiver.	550 kHz (400~ Mod.)	550 kHz	Output meter across voice coil.	L_{24} (OSC Coil) L_{19} (ANT Coil)	Adjust for maximum output by sliding coil (L_{19}) along ferrite core.
7		〃	1500 kHz (400~ Mod.)	1500 kHz	〃	C_{77} (OSC Trimmer) C_{63} (ANT Trimmer)	Adjust for maximum output. Repeat steps (6) and (7).
8	MB	〃	1.6 MHz (400~ Mod.)	1.6 MHz	〃	L_{23} (OSC Coil) – L_{20} (ANT Coil)	Adjust for maximum output. by sliding coil (L_{20}) along ferrite core.
9		〃	4.5 MHz (400~ Mod.)	4.5 MHz	〃	C_{74} (OSC Trimmer) C_{64} (ANT Trimmer)	Adjust for maximum output. Repeat steps (8) and (9).
10	SW	〃	5.9 MHz (400~ Mod.)	5.9 MHz	〃	L_{22} (OSC Coil) L_{21} (ANT Coil)	Adjust for maximum output.
11		〃	18 MHz (400~ Mod.)	18 MHz	〃	C_{65} (OSC Trimmer)	Adjust for maximum output. Repeat steps (10) and (11).

Note: Cement antenna bobbin with wax after completing alignment.

FM, AIR & VHF RF ALIGNMENT

Output of signal generator should be no higher than necessary to obtain an output reading.

Set volume control to maximum.
Set treble control to maximum.
Set bass control to maximum.
Set squelch control to OFF.
Set AFC switch to OFF.

Set fine tuning to center.
Set AC-DC selector switch to DC.
Set power source switch to ON.
Set phono-radio selector switch to radio.
Set power source voltage to 6 volts DC.

	Band Switch Position	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	INDICATOR	ADJUSTMENT	REMARKS
12	FM	Connect to Point **TP_3** through FM Dummy antenna. Common to chassis. (Refer to fig. 11)	90 MHz (400~ Mod.)	90 MHz	Output meter across voice coil.	L_{18} (OSC Coil) L_{16} (Collector Coil)	Adjust for maximum output.
13		〃	106 MHz (400~ Mod.)	106 MHz	〃	C_{37} (OSC Trimmer) C_{16} (Collector Trimmer)	Adjust for maximum output. Repeat steps (12) and (13).

Description (Refer to figs. 6, 19 & 20)

del RF-1600B is a multi-band portable radio which includes VHF and Aircraft bands in addition to FM, AM, Marine Short wave bands. Also, the modulation system is different on the receiving band (as shown below). That o say, the VHF and FM bands can receive FM (Frequency Modulation) broadcasting signals: and Aircraft, AM, rine and Short Wave bands can receive AM (Amplitude Modulation) broadcasting signals.

Band	Receiving Frequency Range	Modulation System of Receiving Signal
VHF	136 ~ 174 MHz	FM
AIR CRAFT	108 ~ 136 MHz	AM
FM	87 ~ 108 MHz	FM
AM	525 ~ 1605 kHz	AM
MB	1.6 ~ 4.5 MHz	AM
SW	5.9 ~ 18 MHz	AM

tailed descriptions of the Front End, Detecting and Squelch Circuits are as follows:

ont End Circuits (VHF/Aircraft FM RF Circuits)

e front end circuits (VHF, Aircraft and FM bands) are packed together in a shielded case, and the individual front d circuit is independent.

so, a switch for selecting these circuits is not employed.

erefore, there is no sensitivity decrease or frequency drift of the dial scale by bad contact of the switch.

portion of an IF signal (taken from the collector of TR_7) is applied to the base of RF Amps. TR_1 & TR_5 (for VHF d FM bands) as forward AGC through diode (D_2), and the detected output of diode (D_9) is applied to the base of Amp. TR_3 (for Aircraft band) and IF Amp. TR_8 as reverse AGC.

applying these AGC voltages to the RF & IF Amplifiers, AGC characteristics at strong input signal have been improved. e forward AGC is not applied to the IF & RF Amp. (TR_3 & TR_8) of the aircraft band, because the modulation system the signal (amplified by TR_3 & TR_8) is the amplitude modulation, and distortion may increase.

etecting Circuits

HF & FM Bands

e 10.7 MHz IF signal of both VHF & FM bands are demodulated by ratio detector diodes (D_7 & D_8) and applied to e audio stage. Also, a portion of the 10.7 MHz IF signal (taken from the secondary winding of transformer T_9) is etected by the diode (D_9) and the rectified voltage is used for AGC.

other words, the rectified voltage of diode D_9 is applied to the base of the IF Amp. (TR_8) as reverse AGC through lters (C_{88} & R_{27}) and the secondary winding of T_4 & T_5.

IR, AM, Marine and Short Wave Bands

he 455 kHz (AM, Marine & Short Wave bands) or 10.7 MHz (Aircraft band) IF signal is detected by the diode (D_9) nd applied to the audio stage.

lso, the DC voltage obtained by the iode (D_9) is applied to the IF & RF mplifiers for AGC.

other words, in the Aircraft band e DC voltage obtained by the diode D_9) is applied to the base of the IF mps. (TR_7 & TR_8) and the base f the RF Amp. (TR_3) as reverse GC.

n the AM, Marine and Short Wave ands, the DC voltage obtained by he diode (D_9) is applied to the base f the IF Amp. (TR_8) as reverse GC. In addition, Delayed AGC is pplied to the Converter (TR_7) by he diode (D_3) in order to improve GC characteristics at the strong nput signal.

apacitor (C_{128}), connected to the econdary winding of T_{10}, is the 10.7 MHz filter. Therefore, C_{128} is ot used in the AIR, AM, Marine and Short Wave bands.

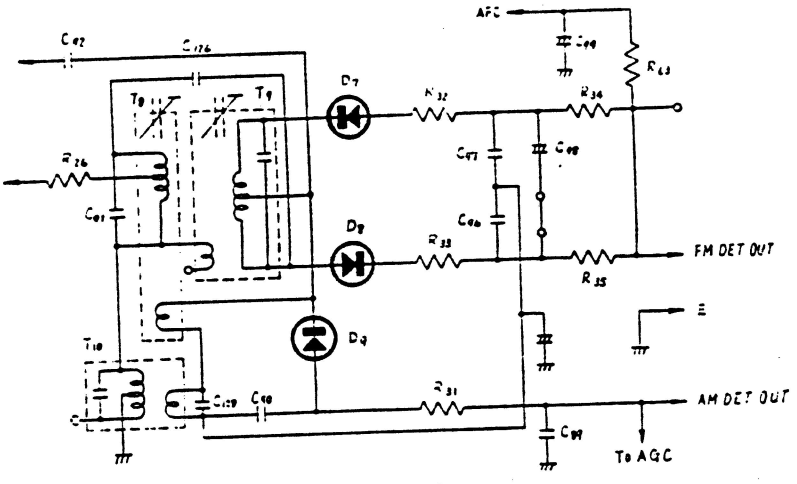


Fig. 19 Detecting Circuits

Squelch Circuits

The DC voltage of D_9, which detects the signal of each band as explained in paragraph (2), is applied as AGC voltage to the IF stage. Then the emitte current in IF Amp. TR_8 is reduced by the AGC voltage. This emitter current change causes changes of the emitter voltage of TR_8. In accordance with emitter voltage change SQUELCH begins to function when AF Amp. TR_{11} stops working because of base bias change of SQUELCH Amp. (TR_{10}). voltage.

When the broadcasting signal is received, the DC current rectified by D_9 flows through R_{29} (I_D). The emitter current (I_E) of TR_8 is thus reduced as a result of the decrease in base bias voltage of TR_8. Then, the voltage drop of R_{19} decreases and the emitter voltage therefore becomes about equal to -B bias voltage.

Because the base bias voltage of TR_{10} is divided by R_{19}, R_{71}, R_{15}, and R_{70} the collector current (I_C) of TR_{10} suddenly decreases. In other words, depending upon the change of I_E in TR_8, the I_C in TR_{10} changes very greatly. This collector current flows through R_{44} & R_{45}, which determines the base bias voltage of TR_{11} C_{108} is a filter capacitor.

When there is a broadcasting signal, there is almost no Ic flow in R_{45} because there is little Ic flow in TR_{10}.

On the other hand, when there is no broadcasting signal, Ic in TR_{10} flows through R_{44} & R_{45} because of the reverse effect of that noted above. Therefore, the I_{C1} in TR_{11} increases, and the voltage drop in R_{49} and R_{48} also increases.

The V_{CE} of TR_{11} is:

$$V_{CE} = -B \text{ bias voltage} - I_{C1}\,(R_{49}+R_{48}).$$

If I_{C1} increases in this formula, V_{CE} drops. Therefore TR_{11} stops operating, and the AF input signal added to the base of TR_{11}, doesn't appear at the collector. Because there is no broadcasting signal at this time, the noise (applied to TR_{11}) is cut off. On the other hand, when a broadcasting signal is received, TR_{11} functions. Therefore the amplified AF input signal appears in the collector of TR_{11}.

R_{15} is a resistor which controls SQUELCH level and, depending upon the amount of noise or signal added to the antenna, determines the operation point.

For biasing, it is basically satisfactory even to connect R_{70} to the -B bias line. If bias voltage should drop, voltage is stabilized by D_4 and D_5 in order that SQUELCH will function normally.

Function of the Switching Diode (D_6)

Because IF Amplifiers (TR_7, TR_8 & TR_9) are commonly used for both 455 kHz & 10.7 MHz signals, the reception sensitivity may decrease, or noise may increase, when the harmonic signal of 455 kHz becomes 10.7 MHz.

Therefore, when receiving signals on the AM, Marine or Short wave band, harmonic signals (10.7 MHz) are tuned by IF transformer T_7 and the 10.7 MHz signal passes through diode (D_6) and capacitor (C_{85}).

Thus the primay winding of T_7 is shunted by the current of diode D_6.

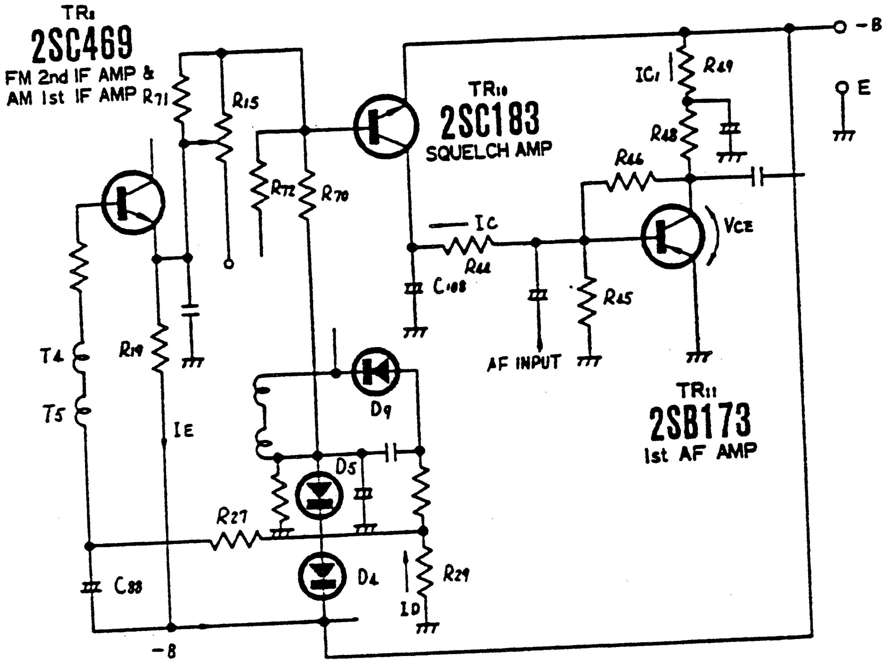


Fig. 20 Squelch Circuits

MODEL RF-1600B

ISO

REPLACEMENT PARTS LIST

1. ÷ indicates parts for the complete cabinet which are included when the cabinet is ordered.
2. Part numbers are indicated on most mechanical parts. Please use this number, therefore, when ordering parts.
3. ISO metric thread screws & parts which emply ISO metric thread screws are identified by ISO marking.

Ref. No.	Part No.	Description
	TRANSISTORS AND DIODES	
	2SC429	VHF RF Amplifier
	2SC429	VHF Converter
	2SC429	AIR RF Amplifier
	2SC645	AIR Converter
	2SC429	FM RF Amplifier
	2SC645	FM RF Converter
	2SC645	FM 1st IF Amp. & AM Converter
	2SC469	FM 2nd IF Amp. & AM 1st IF Amp.
	2SC469	FM 3rd IF Amp. & AM 2nd IF Amp.
	2SC183	Squelch Amplifier
	2SB173	1st AF Amplifier
	2SB173	2nd AF Amplifier
	2SB175	3rd AF Amplifier
	2SB175	Ripple Filter
	2SB324 2SB324	Power Amplifier (push-pull)
	1S351	FM AFC
	1N34A	FM VHF RF D. AGC
	1N34A	IF D. AGC
	1S1211 1S1211	Operation Compensator
	1S1211	Switching
	1N34A 1N34A	FM Detector
	1N34A	AM Detector & AGC
	OA90	AIR D. AGC
	THERMISTOR AND RECTIFIER	
	MT-080	Temperature Compensator
	1S1850R	Rectifier
	CAPACITORS	
	ECC-D05150KC	15PF, 50WV, ±10%, Ceramic
	ECM-S05560K-H	56PF, 50WV, ±10%, Mica
	ECM-S05390K-H	39PF, 50WV, ±10%, Mica
	ECM-S05270K-H	27PF, 50WV, ±10%, Mica
	ECC-D053R5C	3.5PF, 50WV, ±0.25PF, Ceramic
	ECC-D05030C	3PF, 50WV, ±0.25PF, Ceramic
	ECC-D053R5C	3.5PF, 50WV, ±0.25PF, Ceramic
	ECM-S05560K-H	56PF, 50WV, ±10%, Mica
	ECK-D05102P	0.001μF, 50WV, +100%, Ceramic − 0%.
	ECM-S05390K-H	39PF, 50WV, ±10%, Mica
	ECK-D05102P	0.001μF, 50WV, +100%, Ceramic − 0%.
	ECM-S05270K-H	27PF, 50WV, ±10%, Mica
	ECK-D05102P	0.001μF, 50WV, +100%, Ceramic − 0%.
	ECK-E05103P	0.01μF, 50WV, +100%, Ceramic − 0%.
	ECK-E05103P	0.01μF, 50WV, +100%, Ceramic − 0%.
	ECV-1ZW10P12	Trimmer, FM Collector
38, 41, 43	ECV-6EW02X50A	Tuning Gang, FM, AIR, VHF
	ECV-1ZW10P12	Trimmer, AIR Collector
	ECV-1ZW10P12	Trimmer, VHF Collector
	ECC-D05030C	3PF, 50WV, ±0.25PF, Ceramic
	ECC-D05020C	2PF, 50WV, ±0.25PF, Ceramic
	ECC-D05010C	1PF, 50WV, ±0.25PF, Ceramic
	ECC-U05331K	330PF, 50WV, ±10%, Ceramic
	ECM-S05560K-H	56PF, 50WV, ±10%, Mica
	ECC-U05331K	330PF, 50WV, ±10%, Ceramic
	ECM-S05390K-H	39PF, 50WV, ±10%, Mica
	ECC-U05331K	330PF, 50WV, ±10%, Ceramic
	ECC-D05330KC	33PF, 50WV, ±10%, Ceramic
	ECK-D05102P	0.001μF, 50WV, +100%, Ceramic − 0%.
	ECK-D05102P	0.001μF, 50WV, +100%, Ceramic − 0%.

No.	Part No.	Description
	CAPACITORS	
	ECK-D05102P	0.001μF. 50WV. +100%. Ceramic − 0%.
	ECC-D053R5C	3.5PF. 50WV. ±0.25PF. Ceramic
	ECC-D05020C	2PF. 50WV. ±0.25PF. Ceramic
	ECC-D05020C	2PF. 50WV. ±0.25PF. Ceramic
	ECV-1ZW10P12	Trimmer. FM Oscillator
	ECC-D05070DX	7PF. 50WV. 0.5PF. Ceramic
	ECV-1ZW10P12	Trimmer. AIR Oscillator
	ECV-1ZW10P12	Trimmer. VHF Oscillator
	ECK-D05102P	0.001μF 50WV. +100%. Ceramic − 0%.
	ECK-D05102P	0.001μF. 50WV. +100%. Ceramic − 0%.
	ECK-D05102P	0.001μF. 50WV. +100%. Ceramic − 0%.
	ECK-L05102P-D	0.001μF. 50WV. +100%. Ceramic − 0%.
	ECK-L05102P-D	0.001μF. 50WV. +100%. Ceramic − 0%.
	ECC-L05470K-D	47PF. 50WV. ±10%. Ceramic
	ECC-L05470K-D	47PF. 50WV. ±10%. Ceramic
	ECC-L05470K-D	47PF. 50WV. ±10%. Ceramic
	ECK-L05102P-D	0.001μF. 50WV. +100%. Ceramic − 0%.
	ECK-L05102P-D	0.001μF. 50WV. +100%. Ceramic − 0%.
	ECK-L05102P-D	0.001μF. 50WV. +100%. Ceramic − 0%.
	ECK-L05102P-D	0.001μF. 50WV. +100%. Ceramic − 0%.
	PVC-2R-3	Tuning Gang. AM. MB. SW
	ECM-S05101K-H	100PF. 50WV. ±10%. Mica
	ECC-D05020C	2PF. 50WV. ±0.25PF. Ceramic
	ECK-E05103MY	0.01μF. 50WV. ±20%. Ceramic
	ECM-S05121J-H	120PF. 50WV. ±5%. Mica
	ECV-1ZW20P12	Trimmer. AM Antenna
	ECV-1ZW10P12	Trimmer. MB Antenna
	ECV-1ZW20P12	Trimmer. SW Oscillator
	ECK-E05103P	0.01μF. 50WV. +100%. Ceramic − 0%.
	ECK-E05103MY	0.01μF. 50WV. ±20%. Ceramic
	ECK-E05103MY	0.01μF. 50WV. ±20%. Ceramic
	ECQ-S02392KZ	3900PF. 25WV. ±10%. Styrol
	ECC-D05040C	4PF. 50WV. ±0.25PF. Ceramic
	ECV-1YW02D59A	Fine Tuning Gang
	ECV-1ZW20P12	Trimmer. MB Oscillator
	ECQ-S1122KZ	1200PF. 125WV. ±10%. Styrol
	ECQ-S1152KZ	1500PF. 125WV. ±10%. Styrol
	ECV-1ZW20P12	Trimmer. AM Oscillator
	ECQ-S1361JZ	360PF. 125WV. ±5%. Styrol
	ECK-E05103P	0.01μF. 50WV. +100%. Ceramic − 0%.
	ECK-E05103P	0.01μF. 50WV. +100%. Ceramic − 0%.
	ECE-A25V1	1μF. 25WV. Electrolytic
	ECQ-S1152KZ	1500PF. 125WV. ±10%. Styrol
	ECC-D05050C	5PF. 50WV. ±0.25PF. Ceramic
	ECK-E05103P	0.01μF. 50WV. +100%. Ceramic − 0%.
	ECK-E05103P	0.01μF. 50WV. +100%. Ceramic − 0%.
	ECK-E05103P	0.01μF. 50WV. +100%. Ceramic − 0%.
	ECK-E05103MY	0.01μF. 50WV. ±20%. Ceramic
	ECE-A6V10	10μF. 6.3WV. Electrolytic
	ECQ-G05333MZ-N	0.033μF. 50WV. ±20%. Polyester
	ECK-E05223P	0.022μF. 50WV. +100%. Ceramic − 0%.
	ECM-S05470K-H	47PF. 50WV. ±10%. Mica
	ECC-D052R5C	2.5PF. 50WV. ±0.25PF. Ceramic
	ECQ-G05333MZ-N	0.033μF. 50WV. ±20%. Polyester
	ECE-A6V100	100μF. 6.3WV. Electrolytic
	ECK-D05102P	0.001μF. 50WV. +100%. Ceramic − 0%.
	ECK-D05102P	0.001μF. 50WV. +100%. Ceramic − 0%.
	ECE-A16V4R7	4.7μF. 16WV. Electrolytic
	ECE-A25V1	1μF. 25WV. Electrolytic

Part No.	Description
CAPACITORS	
ECA-F25VR22	0.22µF. 25WV. Electrolytic
ECQ-G05472MZ-N	0.0047µF. 50WV. ±20%. Polyester
ECE-A25V1	1µF. 25WV. Electrolytic
ECA-F25VR22	0.22µF. 25WV. Electrolytic
ECQ-G05333MZ-N	0.033µF. 50WV. ±20%. Polyester
ECQ-G05472MZ-N	0.0047µF. 50WV. ±20%. Polyester
ECE-A6V10	10µF. 6.3WV. Electrolytic
ECE-A6V10	10µF. 6.3WV. Electrolytic
ECE-A6V33	33µF. 6.3WV. Electrolytic
ECQ-G05104MZ-N	0.1µF. 50WV. ±20%. Polyester
ECQ-G05102MZ-N	0.001µF. 50WV. ±20%. Polyester
ECE-A6V10	10µF. 6.3WV. Electrolytic
ECE-A10V220	220µF. 10WV. Electrolytic
ECE-A25V1	1µF. 25WV. Electrolytic
ECE-A10V33	33µF. 10WV. Electrolytic
ECE-A10V220	220µF. 10WV. Electrolytic
ECQ-G05103MZ-N	0.01µF. 50WV. ±20%. Polyester
ECQ-G05333MZ-N	0.033µF. 50WV. ±20%. Polyester
ECQ-G05333MZ-N	0.033µF. 50WV. ±20%. Polyester
ECK-E05103P	0.01µF. 50WV. +100%. Ceramic − 0%.
ECE-A10V1000	1000µF 10WV. Electrolytic
ECE-B16V2200	2200µF 16WV. Electrolytic
ECK-D5103P	0.01µF. 500WV. +100%. Ceramic − 0%.
ECK-D5103P	0.01µF. 500WV. +100%. Ceramic − 0%.
ECC-D05010C	1PF. 50WV. ±0.25PF. Ceramic
ECM-S05390K-H	39PF. 50WV. ±10%. Mica
ECM-S05101K-H	100PF. 50WV. ±10%. Mica
ECC-U5030DY	3PF. 500WV. ±0.5PF. Ceramic
ECK-E05103MY	0.01µF. 50WV. ±20%. Ceramic
RESISTORS	
ERD-14TK103	10KΩ. ¼Watt. ±10%. Carbon
ERD-14TK471	470Ω. ¼Watt. ±10%. Carbon
ERD-14VK103	10KΩ. ¼Watt. ±10%. Carbon
ERD-14VK122	1.2KΩ. ¼Watt. ±10%. Carbon
ERD-14TK102	1KΩ. ¼Watt. ±10%. Carbon
ERD-14VK561	560Ω. ¼Watt. ±10%. Carbon
ERD-14VK124	120KΩ. ¼Watt. ±10%. Carbon
ERD-14TK104	100KΩ. ¼Watt. ±10%. Carbon
ERD-14TK104	100KΩ. ¼Watt. ±10%. Carbon
ERD-14VK101	100Ω. ¼Watt. ±10%. Carbon
ERD-14TK101	100Ω. ¼Watt. ±10%. Carbon
ERD-14TK101	100Ω. ¼Watt. ±10%. Carbon
ERD-14VK561	560Ω. ¼Watt. ±10%. Carbon
ERD-14VK101	100Ω. ¼Watt. ±10%. Carbon
EVJ-AOBT12A54	50KΩ (A). Squelch Control. W/ON-OFF Switch (S_7)
ERD-14VK220	22Ω. ¼Watt. ±10%. Carbon
ERD-14VK101	100Ω. ¼Watt. ±10%. Carbon
ERD-14VK102	1KΩ. ¼Watt. ±10%. Carbon
ERD-14VK331	330Ω. ¼Watt. ±10%. Carbon
ERD-14VK121	120Ω. ¼Watt. ±10%. Carbon
ERD-14VK221	220Ω. ¼Watt. ±10%. Carbon
ERD-14VK471	470Ω. ¼Watt. ±10%. Carbon
ERD-14VK332	3.3KΩ. ¼Watt. ±10%. Carbon
ERD-14VK101	100Ω. ¼Watt. ±10%. Carbon
ERD-14VK331	330Ω. ¼Watt. ±10%. Carbon
ERD-14VK221	220Ω. ¼Watt. ±10%. Carbon
ERD-14VK472	4.7KΩ. ¼Watt. ±10%. Carbon
ERD-14VK472	4.7KΩ. ¼Watt. ±10%. Carbon
ERD-14VK154	150KΩ. ¼Watt. ±10%. Carbon
ERD-14VK222	2.2KΩ. ¼Watt. ±10%. Carbon
ERD-14TK102	1KΩ. ¼Watt. ±10%. Carbon
ERD-14VK102	1KΩ. ¼Watt. ±10%. Carbon
ERD-14VK102	1KΩ. ¼Watt. ±10%. Carbon
ERD-14VK472	4.7KΩ. ¼Watt. ±10%. Carbon
ERD-14TK472	4.7KΩ. ¼Watt. ±10%. Carbon
ERD-14TK104	100KΩ. ¼Watt. ±10%. Carbon
EVA-GOAAO1A54	50KΩ (A). Treble Control
EVA-GOAAO1A54	50KΩ (A). Bass Control
ERD-14VK103	10KΩ. ¼Watt. ±10%. Carbon
ERD-14VK102	1KΩ. ¼Watt. ±10%. Carbon
ERD-14VK103	10KΩ. ¼Watt. ±10%. Carbon
ERD-14VK103	10KΩ. ¼Watt. ±10%. Carbon
ERD-14VK823	82KΩ. ¼Watt ±10%. Carbon

lo.	Part No.	Description
		RESISTORS
	ERD-14VK562	5.6KΩ. ¼Watt. ±10%. Carbon
	ERD-14VK562	5.6KΩ. ¼Watt. ±10%. Carbon
	ERD-14TK473	47KΩ. ¼Watt. ±10%. Carbon
	ERD-14VK472	4.7KΩ. ¼Watt. ±10%. Carbon
	ERD-14VK471	470Ω. ¼Watt. ±10%. Carbon
	EVA-GOAA01054	50KΩ (D). Volume Control
	ERD-14VK562	5.6KΩ. ¼Watt. ±10%. Carbon
	ERD-14TK473	47KΩ. ¼Watt. ±10%. Carbon
	ERD-14VK472	4.7KΩ. ¼Watt. ±10%. Carbon
	ERD-14VK223	22KΩ. ¼Watt. ±10%. Carbon
	ERD-14VK472	4.7KΩ. ¼Watt. ±10%. Carbon
	ERD-14VK223	22KΩ. ¼Watt. ±10%. Carbon
	ERD-14VK392	3.9KΩ. ¼Watt. ±10%. Carbon
	ERD-14VK221	220Ω. ¼Watt. ±10%. Carbon
	ERD-14VK680	68Ω. ¼Watt. ±10%. Carbon
	ERD-14VK152	1.5KΩ. ¼Watt. ±10%. Carbon
	ERW-12LKR47	0.47Ω. ½Watt. ±10%. Wire
	ERD-14VK104	100KΩ. ¼Watt. ±10%. Carbon
	ERC-12GM105	1MΩ. ½Watt. ±20%. Solid
	ERC-12GM105	1MΩ. ½Watt. ±20%. Solid
	ERD-14VK332	3.3KΩ. ¼Watt. ±10%. Carbon
	ERD-14VK224	220KΩ. ¼Watt. ±10%. Carbon
	ERD-14VK104	100KΩ. ¼Watt. ±10%. Carbon
	ERD-14VK152	1.5KΩ. ¼Watt. ±10%. Carbon
	ERD-14VK471	470Ω. ¼Watt. ±10%. Carbon
	ERD-14VK183	18KΩ. ¼Watt. ±10%. Carbon
	ERD-14TK562	5.6KΩ. ¼Watt. ±10%. Carbon
	ERD-14TK562	5.6KΩ. ¼Watt. ±10%. Carbon
	ERD-14TK103	10KΩ. ¼Watt. ±10%. Carbon
	ERD-14TK270	27Ω. ¼Watt. ±10%. Carbon
	ERD-14TK220	22Ω. ¼Watt. ±10%. Carbon
	ERD-14TK180	18Ω. ¼Watt. ±10%. Carbon
	ERD-14TK683	68KΩ. ¼Watt. ±10%. Carbon
	ERD-14TK103	10KΩ. ¼Watt. ±10%. Carbon
	ERD-14VK182	1.8KΩ. ¼Watt. ±10%. Carbon
	ERD-14VK182	1.8KΩ. ¼Watt. ±10%. Carbon
		COILS AND TRANSFORMERS
	RLQ-Y05S-5	VHF Antenna Coil
	RLQ-Y25S-5	VHF Antenna Coil
	RLQ-Y05S-5	VHF Antenna Coil
	RLD-4Y53	VHF Collector Coil
	RLQ-Y75S-5	Choke Coil
	RLD-4Y43	VHF Oscillator Coil
	RLQ-Y10S-5	AIR Antenna Coil
	RLQ-Y50S-5	AIR Antenna Coil
	RLQ-Y10S-5	AIR Antenna Coil
	RLD-4Y54	AIR Collector Coil
	RLQ-Y75S-5	Choke Coil
	RLD-4Y44	AIR Oscillator Coil
	RLQ-Y10S-5	FM Antenna Coil
	RLQ-Y75S-5	FM Antenna Coil
	RLQ-Y10S-5	FM Antenna Coil
	RLD-4Y55	FM Collector Coil
	RLQ-Y75S-5	Choke Coil
	RLD-4Y45	FM Oscillator Coil
	RLF-9H11	AM. SW & MB Antenna Coil
	RLO-3R26-T	SW Oscillator Coil
	RLO-3P60	MB Oscillator Coil
	RLO-2C44	AM Oscillator Coil
	RLQ-X121-1	Choke Coil
	RLQ-X121-1	Choke Coil
	RLQ-X121-1	Choke Coil
	RLQ-X121-1	Choke Coil
	RLQ-Y75S-5	Choke Coil
	RLI-4B152	VHF 1st IF Transformer
	RLI-4B152	AIR 1st IF Transformer
	RLI-4B152	FM 1st IF Transformer
	RLI-2B156	AM 1st IF Transformer
	RLI-4B351	FM 2nd IF Transformer
	RLI-2B156	AM 2nd IF Transformer
	RLI-4B351	FM 3rd IF Transformer
	RLI-4B508	FM 4th IF Transformer. Primary
	RLI-4B552	FM 4th IF Transformer. Secondary
	RLI-2B457	AM 3rd IF Transformer
	RLT-3G10-S	Input Transformer. P=5KΩ : S=2.5KΩ
	RLT-2I12-S	Output Transformer. P=50Ω : S=8Ω

MODEL RF-1600B

Ref. No.	Part No.	Description
		COILS AND TRANSFORMERS
	RLT-6E1-S	Choke Coil
	RLT-5J43-W	Power Transformer
		SPEAKER AND EARPHONE
	EAS-12P70SA	12cm (5") PM Dynamic Speaker, 8Ω
	EAE-1FB	Magnetic Earphone 8Ω
		SWITCHES
1-11	ERS-E6C6L50A	Band Selector Switch
-2 & S_{5-1}, S_{5-2}	RSS-128	AC-BATT, RADIO-PHONO Selector Switch
3-2	RSH-62	Power Source Switch
	RSS-91-1	AFC Switch
		MISCELLANEOUS
	RVL-212	Dail Light, 0.075A, 7.5V (2 req'd)
	RHG-211	Rubber Cushion, Dial Light M'tg. (req'd)
	✱RVL-408	Neon Lamp, Arrester, 0.3A
	RJA-39	AC Cord, Power Source
	RHR-111	Grommet, AC Cord
	RJJ-25	Jack, Earphone
	RJF-3111	Jack, Phono
	RJP-39	Plug, Antenna
	RJP-39-1	Plug, Earth
	✱RJS-22-1	Jack, Antenna & Earth (2 req'd)
	✱RJS-23	Terminal, Antenna & Earth (2 req'd)
	✱RHG-634	Rubber Cushion, Jack (RJS-22-1)
	RUS-147	Spring, Band Selector Gear
	RUS-80	Spring, Gear (RDG-7-1)
	RDG-15S	Cam, Band Selector (ISO)
	RDG-10S	Cam, Dial (ISO)
	RDG-7-1	Cam, Dial (Thick)
	RDG-605-1	Cam, Dial (Thin)
	RUS-161	Spring, Dial Scale
	RUE-106	Ball Bearing, Band Selector & Dial Scale (2 req'd)
	RDS-205	Spring, Dial Gear (RDG-1)
	RDS-306	Spring, Dial Drum (RDD-3023)
	RDS-406	Spring, Dial Drum (RDD-30-3)
	RDZ-05-3	Cord, Tuning, 120cm (47¼")
	RDZ-05-4	Wire, Band Selector, 120cm (47¼")
	RMA-328	Bracket, Whip Antenna
	RMY-22	Heat Sink, Transistor (TR_{15} & TR_{16})
	RDT-9047	Shaft, Tuning
	RDD-3023	Drum, Dial (White)
	RDD-30-3S	Drum, Band Selector (Black) (ISO)
	L3-5.5S	Screw, Dial Drum M'tg. (2 req'd) (ISO)
	RUM-44	Bracket, Dial Scale M'tg.
	RDH-303	Indicator, Back Plate
	RUV-336	Rubber Cushion, Volume, Bass, Treble Control (3 req'd)
	RUV-352	Cover, Volume, Bass, Treble Control (3 req'd)
	✱RJK-1405	Case, Battery
	✱DSTR3-8	Screw, Case M'tg. (2 req'd)
	✱DSTR3-10V	Screw, Case M'tg. (2 req'd)
	RMC-195-1	Shield Cover, P.C. Board
	DSTR3-10R	Red Screw, Chassis M'tg. (7 req'd)
	RHG-109	Rubber Cushion, Core Antenna M'tg. (2 req'd)
	✱RBX-58	Bracket, Cover (RKK-630) M'tg.
		APPEARANCE
	RYA-4112S	Cabinet (Complete) (ISO)
	✱RYM-791S	Cabinet Front (Complete) (ISO)
	✱RYF-682	Cover (Complete), Cabinet Back
	✱RYN-260	Cover (Complete), AC Cord & Earphone
	✱RKK-620	Cover Only, Battery Compartment
	✱RKH-94S	Handle, Cabinet (ISO)
	✱RGM-2450	Metal Grille
	RXE-170	Dial Scale (Complete)
	XEARDT160GA	Whip Antenna
	RDP-297-2	Indicating Plate, Band Selector
	RDP-298	Pointer, Dial
	RBS-59	Knob, Band Selector
	RBT-168	Knob, Tuning
	RBV-135-1	Knob, Squelch Control
	FC1.7-4N	Screw, Knob (RBV-135) M'tg.
	RBE-28	Knob, Fine Tuning
	RBE-102	Knob, Volume, Bass, Treble Control (3 req'd)
	✱RBC--3-1	Button, Dial Light
	⊕B3-6NS	Screw, Cabinet Back Cover M'tg. (2 req'd) (ISO)
	⊕B3-12NS	Screw, Cabinet Back Cover M'tg. (3 req'd) (ISO)